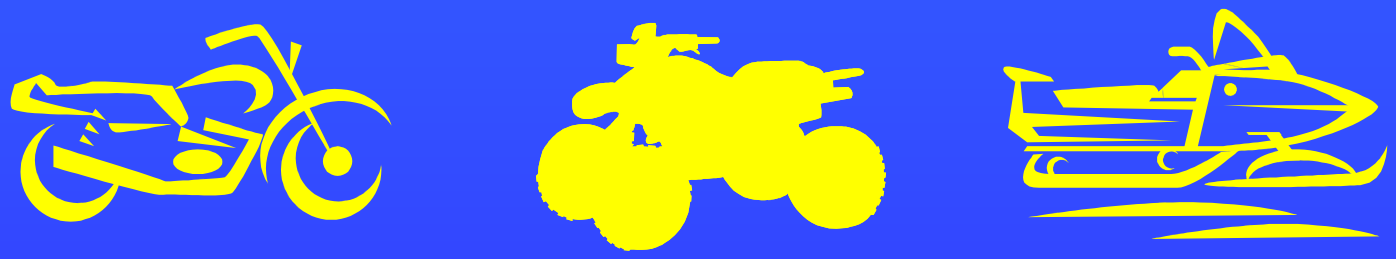
Setting Evaporative Emission Standards for Off Highway Recreational Vehicles (OHRV)



March 23, 2006

Presentation Outline

1. U.S. EPA standards
2. Limitations of U.S. EPA standards
3. California emissions inventory
4. Existing test data
5. Emissions source breakdown
6. Need for ARB regulation
7. Potential control technology
8. ARB and U.S. EPA control comparison
9. Next steps
10. Comments and contact information

U.S. EPA Standards

- Fuel hose permeation standard of 15 g/m^2/day
  - Test temperature of 23 C
- Fuel tank permeation standard of 1.5 g/m^2/day
  - Test temperature of 28 C

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Limitations of U.S. EPA Regulation

- Current technology supports lowering permeation standards
- U.S. EPA regulation does not control vented emissions from the fuel tank
- U.S. EPA regulation does not control carburetor and connector emissions

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California Emissions Inventory (Current Estimate)

Vehicle Type	Population	Total Evaporative Emissions (annual average, tons/day)
All Terrain Vehicles	14865	1.0
Off-Road Motorcycles	157706	15.9
Snowmobiles	19739	0.3
Totals	**192310**	**17.2**

California Emissions Inventory Verification

- Vehicle population will be evaluated
  - DMV data suggests the population is far higher

California Emissions Inventory Verification

- Running loss emissions will be verified
  - Emissions appear high, therefore the emission factor, activity and methodology used to obtain this data will be reviewed

California Emissions Inventory Verification

- Representative equipment will be used to generate any needed emissions factors

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Testing Results for OHRV Tested by Automotive Testing Laboratories (ATL)

- ATL tested evaporative emissions for 4 off-road motorcycles and 4 ATVs
- Diurnal and hot soak emissions were measured for each vehicle
- Refueling and running loss emission were measured for select vehicles
- Data was generated using:
  - Summer fuel (7 RVP)
  - 65-105 F temperature profile
  - Tank Filled to 50%

Testing Results for OHRV Tested by ATL (Continued)

Dirt bikes	Fuel Tank Volume (gal)	Hot Soak Losses (grams per 3 hour soak)	Diurnal Losses (grams/day)	Running Loss (grams/mile)	Refueling Losses (grams/gal)
82 Honda XR200R 4cyc	2.40	3.96	8.36	0.88	
00 Kawasaki KX250 2cyc	2.20	1.80	8.29		2.51
84 Suzuki RM125 2cyc	2.00	4.49	6.81		
01Yamaha WR250F 4cyc	3.20	9.70	18.57	1.27	
Average for Dirt Bikes	2.45	4.99	10.51	1.08	
ATVs					
83 Honda FL250 (Odyssey) 2cyc	3.00	2.24	16.98		
01 Yamaha YFZ350N-W (Banshee) 2cyc	3.20	2.64	15.79	1.28	
01 Suzuki LT-F250 (Quadrunner) 4cyc	3.20	2.16	5.36	0.08	2.95
88 Kawasaki KLF220 (Bayou) 4cyc	2.60	4.96	15.40	0.9	
Average for ATVs	3.00	3.00	13.38	0.75	

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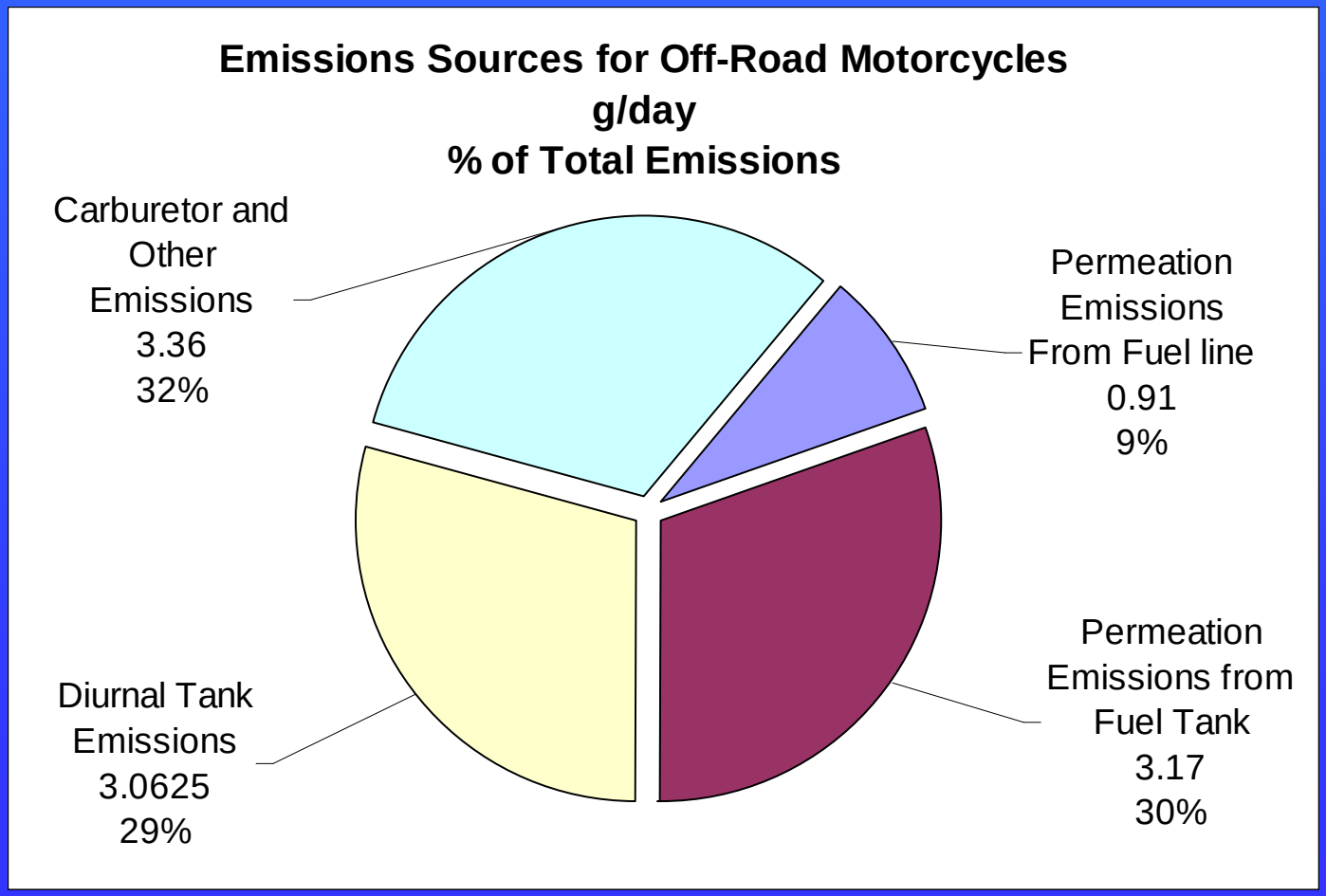
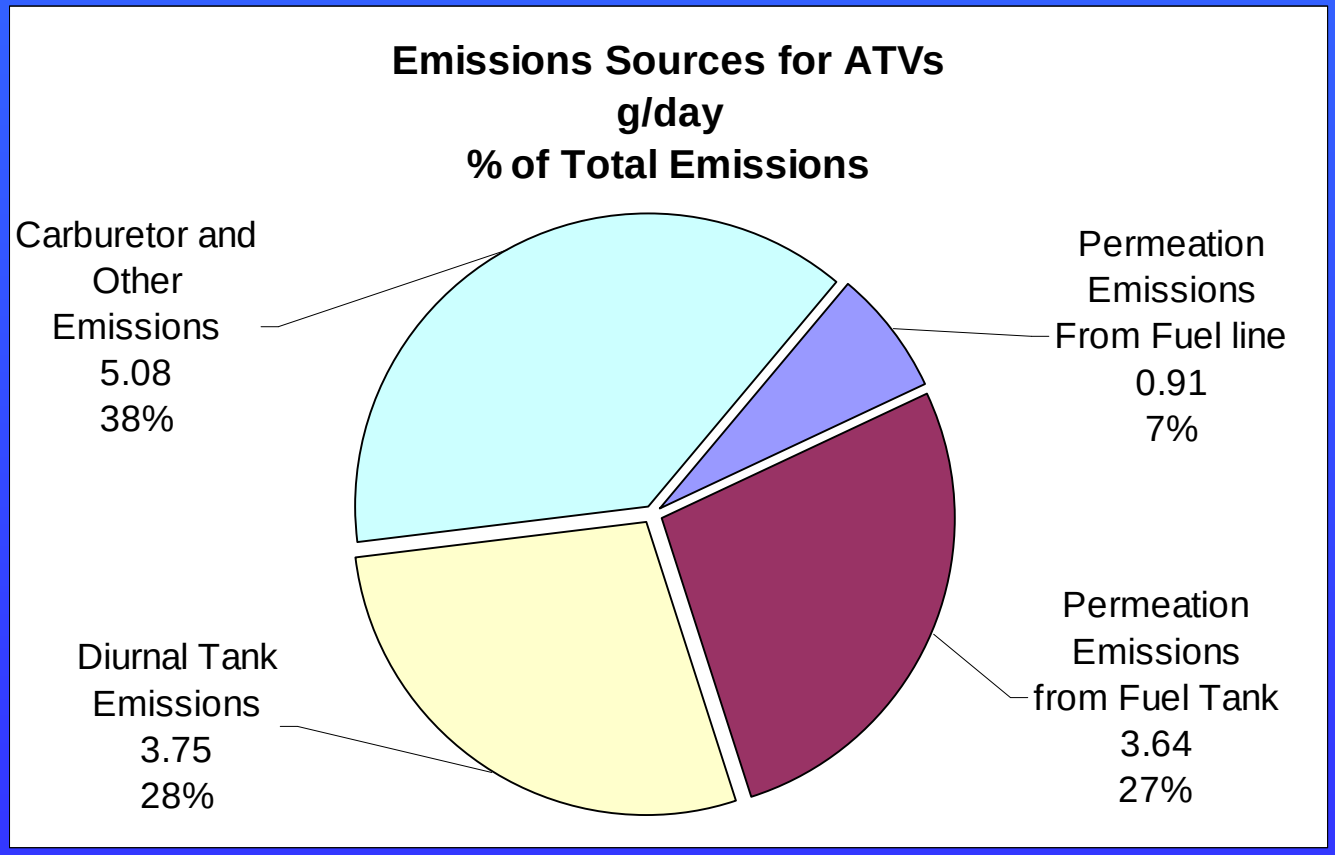
Emissions Source Breakdown

- Emissions by component are calculated from:
  - ATL data
  - Vented emissions calculated using
    - Reddy Equation
    - Summer fuel (7 RVP)
    - 65-105 F temperature profile
    - Tank filled to 50%
  - Permeation emission calculated using:
    - 1.5 feet of ¼ inch fuel line
    - A cubic fuel tank
    - Permeation equal to the standards
    - Uncontrolled permeation rates of:
      - 12 g/m^2/day for fuel tanks
      - 100 g/m^2/day for fuel hose

Breakdown of Uncontrolled Emissions Sources for Off-Road Motorcycles



Breakdown of Uncontrolled Emissions Sources for ATVs



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Need for ARB Regulation

- Significant additional reductions are needed for ozone attainment
- Permeation emissions can be controlled further
- Vented emissions can be controlled
- Carburetor and connector emissions can be controlled

Permeation Technology Advancements from SORE Allow Lower ARB Standards

Company name	Product	Test Fuel	Test Results (g/m^2/day)	Equivilent Results at 28 C for tanks and 23 C for hoses *	EPA standard @ test temperature ($g/m^2/day$
Arkema	Tank	CE10	0.80	0.35	1.5 @28C
Custom Pak	Tank	California Cert. fuel	0.30	0.13	1.5 @28C
Kelch	Tank	California Cert. fuel	0.26	0.11	1.5 @28C
Avon Automotive	Hose	California Cert. fuel	3.94	1.71	15 @23C
Dana	Hose	Indolene	7.40	3.22	15 @23C
DTR industries	Hose	Indolene	3.20	1.39	15 @23C
Gates	Hose	California Cert. fuel	8.20	3.57	15 @23C
good year tire	Hose	CE10	12.32	5.36	15 @23C
Mold-Ex	Hose	California Cert. fuel	4.63	2.02	15 @23C
Parker	Hose	CE10	12.60	5.48	15 @23C
Parker (Model # II)	Hose	CE10	3.75	1.63	15 @23C
Teleflex	Hose	CE10	11.13	4.85	15 @23C

* Increase in test temp of 10 deg C leads to double the permeation

Need to Control Vented and Carburetor Emissions

- Vented emissions account for ~30% of total emissions
- Carburetor and fittings emissions account for another ~30% of total emissions
- Controlling these emission sources will result in substantial reductions

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Potential Control Technologies to be Evaluated

- Active and passively purged carbon canisters
- Low permeation fuel hoses
- Low permeation fuel tanks
- Fuel injection systems

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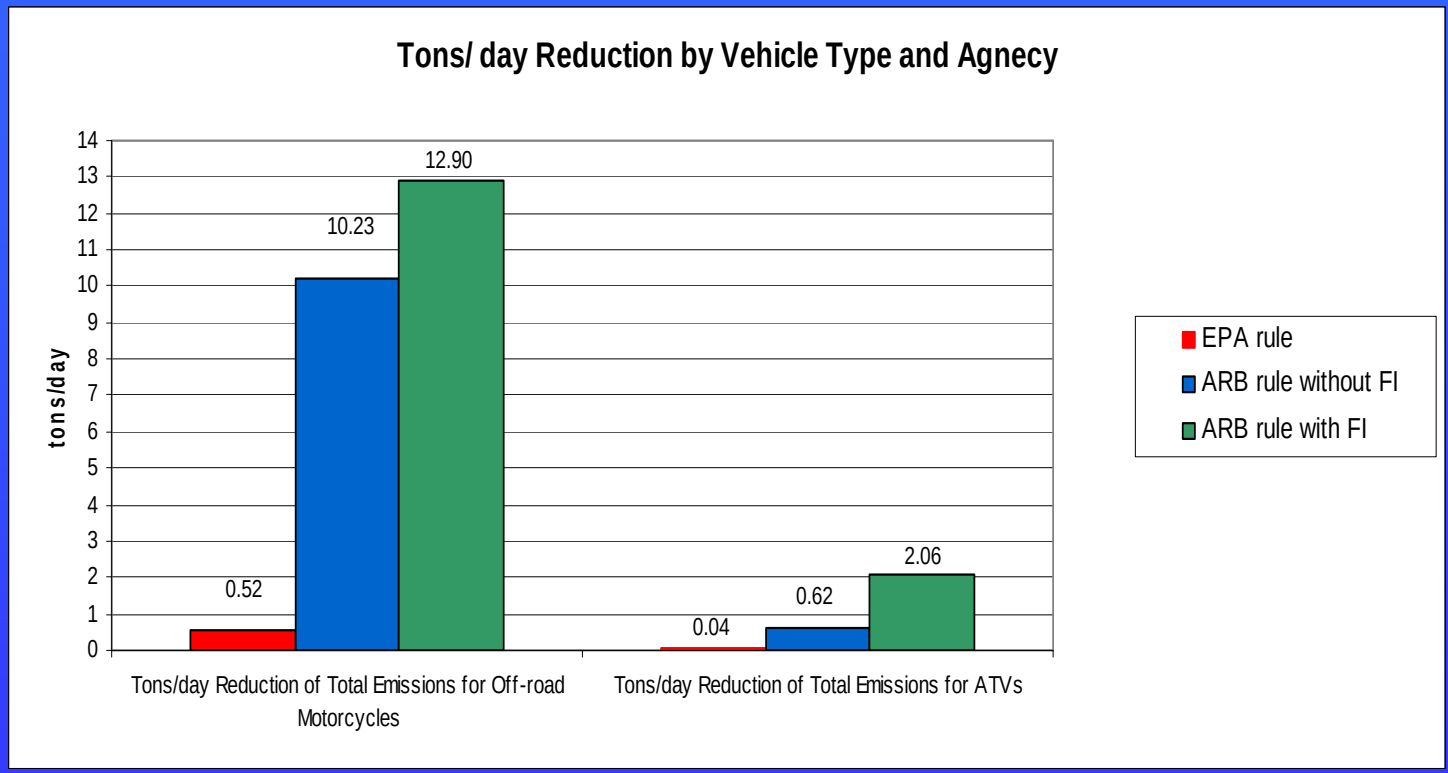
ARB and U.S. EPA Evaporative Emissions Control Comparison Graph



ARB assumptions:

- fuel hose permeation of 5g/m^2/day
- fuel tank Permeation of 0.5 g/m^2/day
- 65% diurnal and running loss control without FI
- 80% diurnal and running loss control with FI
- All values based on current emissions inventory

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Next Steps for Rule Development (Tentative)

- Emissions Inventory Development
  - Spring 2006 – Spring 2007
- Control Technology Evaluation
  - Summer 2006 – Summer 2007
- Development of Staff Proposal
  - Summer 2007 – 2008
- Board Hearing
  - 2008

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Comments?

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